

CLAIMS

1. A continuous process for the hydroformylation of propylene comprising feeding
5 (i) a propylene stream at a rate of at least 3 tonnes per hour, and
(ii) synthesis gas comprising hydrogen and carbon monoxide
to a hydroformylation reactor in which the propylene is hydroformylated
over a rhodium containing catalyst, characterised in that
(a) the propylene stream contains at least 97 mole % of propylene;
10 (b) the molar ratio of (H₂+CO) contained in the fresh synthesis gas fed
to the process, to the propylene contained in the fresh propylene stream
fed to the process, is greater than 1.93; and
(c) in the synthesis gas feed, the hydrogen is present in molar excess
over the amount of carbon monoxide.
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2. The process according to claim 1 in which the propylene stream contains
at least 99.5 mole % of propylene.
3. The process according to claim 1 or 2 in which the sulphur content of the
20 propylene feed is not greater than 500 ppb by weight, calculated on an
atomic basis.
4. The process according to any of the preceding claims in which the reactive
nitrogen content of the propylene feed is not greater than 10 ppm by
25 weight, calculated on an atomic basis.
5. The process according to any of the preceding claims in which the chlorine
content of the propylene feed is not greater than 5 ppm by weight,
calculated on an atomic basis.
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6. The process according to claim 3, 4 or 5 wherein the propylene feed contains, by weight and on an atomic basis, less than 50 ppb sulphur or less than 50 ppb reactive nitrogen or less than 50 ppb chlorine.
- 5 7. The process according to claim 6 wherein the aggregate weight content in the propylene feed of sulphur and reactive nitrogen and chlorine, on an atomic basis, is less than 50 ppb.
8. The process according to any of the preceding claims in which the
10 hydroformylation catalyst is an oil-soluble rhodium complex comprising a low valence rhodium (Rh) complexed with a triorganophosphorus compound.
9. The process according to claim 8 in which the triorganophosphorus
15 compound comprises an oil-soluble triarylphosphine, trialkylphosphine, alkyl-diaryl-phosphine, aryl-dialkylphosphine, triorganophosphite or bisphosphite containing, per molecule, one or more phosphorus atoms capable of complexing with Rh.
- 20 10. The process according to claim 9 in which the triorganophosphorus compound is triphenylphosphine or 6,6'-[[3,3',5,5'-tetrakis (1,1-dimethylethyl)-1,1'-biphenyl-2,2'-diyl] bis (oxy)] bis-dibenzo [d,f] [1,3,2]-dioxaphosphin.
- 25 11. The process according to any of the preceding claims in which the Rh concentration in the hydrofomylation reaction mixture is in the range of from 1×10^{-5} to 1×10^{-2} moles/litre.
12. The process according to any of the preceding claims in which the
30 hydroformylation is carried out at a temperature in the range of from 40 to 200°C.

13. The process according to any of the preceding claims in which the hydroformylation is carried out at a pressure in the range of from 0.05 to 10 MPaa.
- 5 14. The process according to any of the preceding claims in which the carbon monoxide partial pressure in the reactor is not greater than 50% of the total pressure.
- 10 15. The process according to any of the preceding claims wherein the propylene feed stream contains up to 5000 ppb by weight of dimethyl ether.
- 15 16. The process according to any of the preceding claims wherein the molar ratio of (H₂+CO) to propylene is greater than 1.94.
17. The process according to any of the preceding claims wherein the molar ratio of (H₂+CO) to propylene is at most 2.00.
- 20 18. The process according to any of the preceding claims wherein the molar ratio of hydrogen to carbon monoxide in the synthesis gas feed is from >1:1 to 10:1.
19. The process according to claim 18 wherein the ratio is from 1.1:1 to 1.2:1.